

## How should we teach environmental literacy? Critical reflections on virtual teaching and learning experiences.

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### Abstract

This paper will serve several purposes. First we discuss the notion of environmental literacy and situate it in the higher education context in which we work. Secondly we describe a first year environmental literacy subject taught in the Centre for Excellence in Outdoor and Environmental Education at La Trobe University and the findings of research into student perceptions of their learning. Finally, we will discuss issues and questions arising from the findings in relation to recommendations from higher education research on teaching and learning for environmental and sustainability literacy development. Questions will address the imperative for environmental literacy in contemporary Australian society and the nature of knowledge and skills needed in this context. We will examine the roles of online learning and experiential learning, and hidden curriculum associated with both. The paper will conclude with suggestions for future curriculum development in relation to environmental literacy.

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### Introduction

Sustainability means working to understand and realize sustainability values in ways where economic, social and ecological dimensions are as far as possible mutually enhancing. It's about creating the conditions of survival, security and wellbeing for all. Unlearning, re-learning, new learning are the essences of this challenge... We have a ...challenge, to shift from "information education" to "wisdom education". (Sterling, 2004, p. 88)

Sterling's plea for a shift to 'wisdom education' is based on an acknowledgement that the world is in the midst of an ecological crisis. This crisis is now widely recognised, particularly in relation to global warming, unsustainable human consumption and their environmental and social implications. The extent to which education can play a part in ameliorating this ecological crisis is debatable but the expectation that the education sector has a significant role is clear. The UNESCO declaration of 2005-2014 as the *Decade for Education for Sustainable Development* is an international manifestation of this view. What then is the role of education, and particularly higher education, in this context?

Despite contested notions about the meanings of 'sustainability' and 'sustainable development', there is general agreement that issues of *unsustainable* human activities must be addressed from multi-dimensional perspectives - primarily environmental, social and economic. However, as Sterling (2004) alludes to above, there are particular educational challenges around how sustainable human practices can be learned and how *education*, as a culturally embedded system, can effectively address such issues (see also Bowers, 1993, 2001; Orr, 1992, 2004). These questions have been much debated in environmental education discourses and the notions of environmental (and now sustainability) *literacies* have emerged as a possible 'way forward'. Increasingly higher education institutions are seen as important contributors to the development of an environmentally literate citizenry (Higher Education Academy, 2006; Orr, 1992, 2004; Tilbury, Podger & Reid, 2004; Tilbury, Keogh, Leighton & Kent, 2005). Like sustainability, conceptualisation of environmental literacy is emergent and dynamic but its importance is now recognised, not just by environmental educators but by scientists, health professionals and farmers amongst others.

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In this context, Lugg (2007), Martin (2008) and Stewart (2004) consider the role outdoor education might play in developing environmentally literate outdoor educators and pre-service teachers. The authors suggest that, through thoughtful pedagogy, outdoor education is well positioned to make a contribution that may ‘... promote environmental knowledge founded in direct experience of place, based on ecological principles and ultimately seeking a passion for continuing a relationship based on care and respect’ (Martin, 2008: 36). Martin’s argument is based on a familiar premise that outdoor education generally occurs in non-urban environments and primarily involves experiential approaches to learning in these environments. Stewart (2004) provides an example of outdoor education pedagogy framed around understanding the cultural and natural history or ‘stories’ of the Murray River, Notable for the purposes of this paper, is his pedagogical concern for developing *cognitive* understanding, *physical* interaction and *emotional* connections of/with this environment,

Our canoe journeys down the river are focused on seeing the multiple ways people utilize, understand and impact on the Murray. On these journeys we travel enough distance to see different aspects of the Murray but not too far that the focus becomes the activity of canoeing . . . I have generated these experiences out of a desire to connect students with the Murray in emotional and physical ways, but also to build awareness of the health of the river that is shaped by structural aspects of our culture. (Stewart, 2004, p. 46)

Such an approach provides a practical illustration of Lugg’s (2007) argument that a ‘revised’ approach to outdoor education could develop environmental and sustainability literacy by integrating environmental, social and cultural dimensions of experiential learning with critical pedagogy.

In this paper we explore questions about the roles of outdoor education and information technology in developing environmental literacy in future educators. We consider some effects of online and independent learning on first year outdoor education students and potentials and pitfalls in relation to environmental literacy development. We also consider implications for environmental literacy of apparently opposing pedagogical approaches; *outdoor experiential* and *virtual* learning in this context. Discussion focuses around a specific environmental literacy subject that the authors taught with first year students in a Bachelor of Physical and Outdoor Education course. In this process we engage with questions related to Sterling’s (2004) challenge to shift from *information* education to *wisdom* education.

### **Environmental literacy**

We Australians bear a special responsibility in this world of Gaian imbalance, for we are the greatest gougers at the Earth – the people who earn their living by selling the produce of Earth’s crust to the planet. With us lies the burden of ensuring that whatever we unearth does not, as it disperses into the waters and the heavens, destroy the balance upon which life depends. (Flannery, 2008, p. 62)

Flannery’s essay is a bold statement and an impassioned plea to Australians to acknowledge the devastating environmental effects of our affluent lifestyles and to take informed action to redress this ecological imbalance . How many Australians understand what Tim Flannery is talking about here? How many of us would be able to explain the physical processes, ecological and social implications of large-scale mining and extravagant use of fossil fuels?

What (if anything) can we do to change this situation? Such issues are at the heart of questions around the role of education in developing environmentally literate<sup>1</sup> citizens.

Orr (1992, p. 90), an American environmental educator and academic, claims that, ‘... all education is environmental education. By what is included or excluded, emphasised or ignored, students learn that they are a part of or apart from the natural world.’ Considered from this perspective, all forms of education can be seen as contributing to *ecological literacy* or illiteracy. Orr’s concern for the lack of ecological literacy in the general (American) population relates to the ‘crisis of sustainability’ or the ‘fit between humanity and its habitat’ (1992, p. 83). He argues that to address contemporary environmental and social issues, higher education institutions have an obligation to develop ecologically literate citizens, informed and actively engaged in issues of sustainability. To this end he argues for a more holistic approach to education in which personal experience is valued and direct experience with, and understanding of, one’s local environment are paramount.

. . . it is rather a deeper failure in the educational process to join intellect with affection and loyalty to the ecologies of particular places , . . . a failure to bond minds and nature . . . I suggest that at all levels of learning . . . some part of the curriculum be given to the study of natural systems roughly in the manner in which we experience them. (Orr, 2004, p. 95)

This call for more holistic approaches to developing ecological or environmental literacy is echoed by many environmental educators (for example see Sterling, 2004; Capra, 2006). Since Orr’s notion of ecological literacy, other conceptualisations have developed including; ‘weak’ and ‘strong’ (Stables & Bishop 2001), functional, cultural and critical environmental literacies (Stables, 1998) and ‘ecoliteracy’ (Capra, 2003).

Stables and Bishop (2001) assert that the understanding of environment as text is essential for a *strong* conceptualisation<sup>2</sup> of environmental literacy, which acknowledges different social and cultural constructions of environments, incorporates functional, cultural and critical literacies<sup>3</sup> and draws on different disciplines to examine environmental issues. The authors argue that a strong environmental literacy approach would contribute to a more successful form of environmental education pedagogy:

An environmental education which runs independently of an exploration of cultural, aesthetic, personal and even irrational views of the environment will prove insufficient to our needs, as it will harness not ‘hearts and minds’ but merely part of the mind, in a limited range of contexts, and with a limited view of the earth as essentially mechanical and liable to breakdown...but not to improvement. The development of a strong conceptualisation of environmental literacy thus has the potential to result in an increased *care* for the world in a way that conventional models of environmental education alone cannot. (Stables and Bishop, 2001, p. 96)

Pedagogical features of Stables and Bishop’s *strong* environmental literacy that are relevant to our research are: it is situated (not universal), socially and culturally embedded, multi-disciplinary and incorporates the notion of *care* or *affective* learning. These features are reflected in outdoor environmental education literature (see Martin, 1999, 2008; Nicol & Higgins, (2004); Stewart 2004 for example). The difference is that Stables and Bishop have

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<sup>1</sup> *Environmental* literacy is often used synonymously with *ecological* literacy and *sustainability* literacy, all of which can be broadly interpreted.

<sup>2</sup> A *weak* conceptualisation would adopt a narrower perspective such as an understanding of environmental issues based only on scientific knowledge.

<sup>3</sup> See Stables (1998) for a full discussion of these forms of environmental literacy

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not articulated a need for *direct* experience of natural environments, however this is implied in that in order to ‘read’ (or ‘write’) environments as text, some form of personal interaction with particular environments seems necessary. Although ‘interaction’ can be broadly interpreted, this would suggest that *strong environmental literacy* would also require some degree of experiential and/or participatory approaches to learning in/with environments.

Similarly, although Capra’s (2003) *ecoliteracy* is based on different premises, he too advocates experiential and participatory approaches to learning. Coming from a scientific discipline and drawing on economic and social theory, Capra argues that in order to live sustainably, we need to re-design our world based on the six ecological principles; networks, cycles, solar energy, partnership, diversity and dynamic balance. This argument is based on the premise that the *oikos* or *earth household*, functions as a sustainable web of life within which humans reside and to which we are obligated. Capra, like Orr and others (for example Alvarez & Rogers, 2006; Williams, 2008), asserts that this knowledge requires a more situated, experiential and participatory form of pedagogy:

This involves a pedagogy that puts the understanding of life at its very centre, an experience of learning in the real world (growing food, exploring a watershed, restoring a wetland) that over-comes our alienation from nature and rekindles a sense of place; and a curriculum that teaches our children the fundamental facts of life - that one species’ waste is another species’ food; that matter cycles continually through the web of life; that energy driving the ecological cycle flows from the sun; that diversity assures resilience; that life, from its beginning more than three billion years ago, did not take over the planet by combat but by networking. (Capra, 2003, p. 202)

These exhortations for educational experience of natural environments and ‘real world’ learning for developing ecological literacy reflect a pedagogical approach recommended in several reviews of research in education for sustainable development (ESD) (see Parkin, Johnston, Buckland, Brookes & White, 2004; Tilbury et al., 2005). It is in fact difficult to find anyone who is now advocating *solely* cognitive approaches to environmental or sustainability pedagogy although all recognise the importance of cognitive understanding and of critical analysis of environmental issues. Environmental literacy can therefore reasonably be seen to require a range of approaches to teaching and learning. As outdoor environmental educators we (the authors) understand the potential of ‘real world’<sup>4</sup> learning, particularly in natural environments, for developing first hand understanding of environmental problems, processes and, perhaps, an affinity with nature.

Importantly however, ‘real world’ learning can occur in *any* environment and, where that entails encounters with individuals and organisations in local communities, also has the advantage of exposing students to the ‘messiness’ of sustainability issues. As Alvarez and Rogers (2006) found in their teaching and research in a higher education context, students’ interactions with people in their own communities, revealed in an ‘authentic’ way, the complexities and contradictions of environmental issues in people’s lived experience. This human dimension of environmental issues can be neglected in discussion of pedagogy in environmental or sustainability education. If we broaden the notion of ‘experience of ‘nature’ to incorporate human activity as part of the ‘natural’ environment, the social and economic dimensions of environmental issues become more prevalent and provide opportunity for deeper learning and perhaps *strong* environmental literacy as described by Stables and Bishop (2001).

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<sup>4</sup> We recognise that there are multiple interpretations of reality and that the ‘real world’ for some could include virtual worlds.

## Online Learning and Environmental Literacy Development

Most advocates of experiential pedagogy in ‘real world’ settings recognise that this approach can be problematic in higher education institutions where the trend is to seek more efficient ways of ‘delivering’<sup>5</sup> learning for students. In this context one question that arises is: Is there a role for virtual learning in developing students’ environmental literacy in higher education settings? If so, can online or distance learning facilitate the notion of *strong* environmental literacy?

Given the way in which environmental and outdoor educators have tended to interpret Orr’s (1992) challenge to educators<sup>6</sup>, it is somewhat paradoxical that White (2006) also draws on Orr’s (1992) appeal to educators to engender a ‘sense of wonder’, to suggest that environmental educators need to be open to online or ‘distance’ pedagogies. White asserts that distance education is flexible and adaptable, offering opportunities for open-ended learning appropriate for an uncertain future. He argues that distance education offers opportunities to overcome social inequities in educational practice and that by adopting a ‘social systems’ approach to distance education, online learning can meet the needs of environmental education. On the other hand he acknowledges that while use of online learning may redress inequities relating to access to educational opportunity (for women for example), it may also marginalise those who do not have access to computers or internet connectivity. While White’s argument rests primarily on the assumption that knowledge is acquired through cognitive learning, he recognises the need for *affective* learning in developing environmental literacy and argues that ‘Affective learning is achievable in a distance education environment by working to simulate a face-to-face environment’ (2006, p. 88). This raises interesting questions about the importance of relationship and the nature of interpersonal interaction in developing affective learning or *care* as referred to by Stables and Bishop (2001) and by Martin (2008):

It should now be clear to Western civilisation that it is impossible to reshape the planet in a sustainable way. Rather, we need to reshape ourselves. Outdoor education must play a significant role here and it must start with developing in every young person a love and respect for nature and the capacity to understand and think about our connectedness to the earth . . . it’s an emotional base, founded in love and respect, that drives action. (Martin, 2008, p. 37)

If, as White (2006) suggests, the face-to-face environment needs to be simulated in order to engender affective learning, why not conduct educational experiences in *actual* rather than *virtual* environments where possible?

### The higher education context

Reviews of higher education’s contribution to environmental sustainability recognise that this sector has been slow to respond in a systematic way to emerging issues through innovative curricula and pedagogy. In fact as White (2006) points out, the drive for conceptual and curriculum development in this area has tended to come from non-government organisations and international political forums such as the United Nations. In higher education institutions most curriculum and pedagogy relating to sustainability has been driven by enthusiastic individuals, rather than through systemic or holistic planning approaches (Parkin et al., 2004; Tilbury et al., 2005). The recommendations outlined above, for experiential learning in ‘real

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<sup>5</sup> An interesting paradox is set up since this term suggests a transmissive approach to pedagogy while the term ‘flexible delivery’ is often used in relation to online learning which is hailed as student-centred and interactive.

<sup>6</sup> See Martin (2008) for example.

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world' settings, are the results of the efforts of such individuals, often working in isolation in universities. More systematic use of such approaches to teaching and learning would require deeper levels of change to higher education knowledge and organisational structures (Orr 2004; Sterling, 2004), and as such are problematic. The university in which this research is situated for example, has dedicated considerable resources to assisting staff with developing *online* teaching units with a view to providing 'flexible delivery' modes to cater for a diverse student population in different locations throughout Victoria and overseas. At the same time the university has recognised the importance of environmental sustainability in its core values and has recently established a taskforce to address 'environmental responsibility' and a Director of Sustainability. The convergence of university agendas – online learning and environmental sustainability- led to the involvement of the authors in developing and teaching a subject, Environmental Literacy for Sustainable Futures.

#### **The Subject**

The subject, *Environmental Literacy for Sustainable Futures*, is a new one semester unit and therefore 'under development'. A number of criteria were provided that both afforded and constrained the development of the unit. These included that it should: be at 1st year level and preferably in 'block mode', include a substantial on-line presence and involve group work. It needed to involve students in examining different perspectives of environmental issues but not premised on teaching staff having a particular discipline-based expertise. The number of hours traditionally allocated to face-to-face contact with students through either lectures or tutorials was, in part, replaced by virtual learning activities designed to enable more flexible and student-centred learning processes. This was the first time either of the authors had been involved in on-line teaching of this nature.

The broad objectives of the subject were for students to understand key concepts and debates relating to contemporary environmental issues in Australia and to be able to critique arguments relating to these issues. Students were required to use a range of texts and internet resources to research issues and to work with others to plan and undertake a group project and presentation. The content and delivery of the subject included both face-to-face (lectures and tutorials) and online components (readings, resources, discussion spaces quizzes and assignments). Lectures introduced the broad environmental issues as identified in a class text by Lowe (2005). These were; climate change, water, waste, energy use and biodiversity. The first assignment involved an investigation of a local issue of the student's choice, selected from the broad issues outlined above. A short paper presenting findings was posted online and each student wrote a 'critical friend' response to a peer paper (also posted online). From here students worked in groups on a deeper, multi-perspective examination of their issue and, at the completion of the subject, each group made a peer-assessed class presentation on their project and submitted a paper. Time was also allocated for informal face-to-face meetings for groups to plan their projects. While students were encouraged to contact teachers either on-line or face-to-face, this *rarely occurred*. All written assessment was submitted and assessed on-line, including peer critique of one assessment task.

#### **The Research Project**

The approach advocated in teaching the environmental literacy subject challenged our own teaching practices. As outdoor environmental educators we value face-to-face teaching and experiential learning, but we were interested in researching students' experiences of this subject to help inform our future teaching practices. The research project described here addresses two areas we were particularly interested in. Firstly, understanding the environmental learning processes of students and, secondly, the influence of the on-line component of the subject on their learning. For the purpose of this subject, we interpreted

development of students' environmental literacy as learning processes to develop their knowledge and understanding of a particular environmental issue and the skills to critically evaluate this issue.

Since we were investigating students' experience of this course and the learning processes within it, the study was a qualitative case study using a grounded theory approach to data analysis. In this context we considered the following questions:

- I. What are the students' perceptions of their learning processes in this subject?
- II. How do they see these learning processes as contributing to their development of environmental literacy?
- III. What are the unintended consequences (e.g. hidden curriculum) for outdoor education students if learning is predominantly based in online and classroom environments?

## Research Methods

Three main instruments were used to generate data in this research project:

- (i) questionnaires completed by students before and after the subject (optional),
- (ii) student evaluation of group projects (part of an assignment)
- (iii) subject evaluation forms (university evaluation protocol)

The pre-subject questionnaire was designed to evaluate students' backgrounds and prior understanding of environmental issues. From this questionnaire numerical data were summarised. The post-subject questionnaire was designed to enable students to reflect on their learning experiences throughout the subject. These reflections included the role of the on-line component of the subject, their collaborative learning in the group project and their development of critical thinking skills. Both questionnaires included a combination of questions requiring responses on a Likert-type scale and open-ended questions. Students provided written evaluation of their major assignment, including evaluation of the group processes. 80% of the students enrolled in *Environmental Literacy for Sustainable Futures*, agreed to participate in the project.

Several limitations have been identified as a result of this research process. As teachers and researchers it is sometimes difficult to 'see' what is going on when we 'wear two hats'. On one hand we are developing and teaching the subject while also trying to understand students' learning experiences. Inevitably we shape both the teaching and research processes and as such are implicated in the findings. Secondly, as researchers we were also 'co-learners' in sustainability pedagogy and online teaching and learning, thus possibly limiting student learning opportunities. Thirdly, the use of a questionnaire as an instrument for this project tends to confine data to the constructs of the questions asked, thus restricting emergent possibilities. We had intended to conduct a focus group discussion, to probe students' perceptions of their learning experiences however this was not possible due to time constraints. In spite of these limitations the results from the surveys have provided some insights that we can draw upon to further develop this subject.

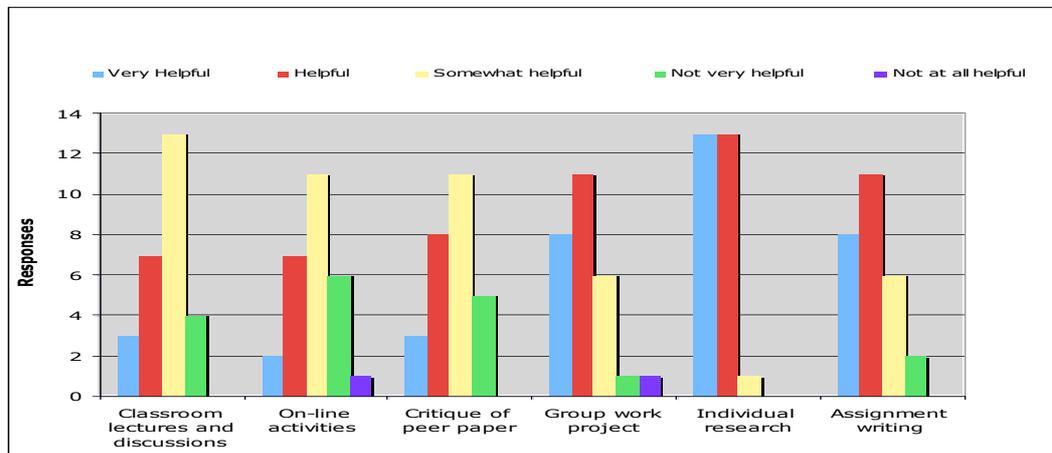
## Results and Discussion

### *I. What are the students' perceptions of the learning processes in this subject?*

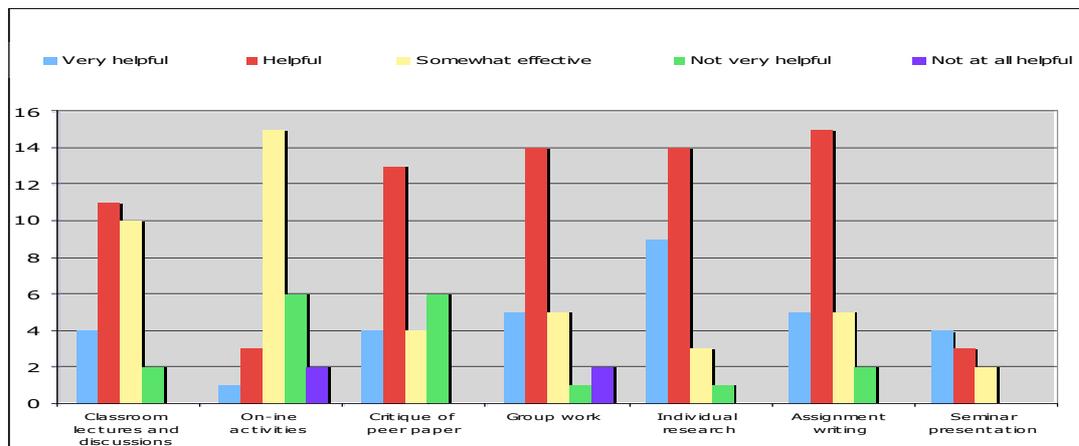
As already discussed we interpreted the development of students' environmental literacy as the ability to understand a particular environmental issue from a range of perspectives together with the capacity to critically evaluate arguments relating to these issues. In the context of this subject the range of learning environments included classroom instruction, on-

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line learning and group or individual learning environments. Teaching and learning processes included didactic approaches (lectures and presentations), investigative approaches (individual research), assessment and evaluation (critical thinking, quizzes, peer assessment), problem solving and group work (assignment planning, presenting and writing). Students were asked to evaluate how these learning processes contributed to their environmental knowledge (Figure 1) and critical thinking skills (Figure 2).



**Figure 1. Learning processes that helped students develop knowledge and understanding of environmental issues (Source: Post-subject questionnaire)**



**Figure 2. Learning processes that helped students develop critical thinking skills (Source: Post-subject questionnaire)**

These results show that students value the student-centred, independent learning processes provided through group work and individual research associated with their assignments more than the formal instruction provided either face-to-face or online. The questionnaire results also suggest that the group work project was helpful in developing a deeper understanding of their environmental knowledge and critical thinking skills. However, drawing from their evaluations of the projects, it was often the individual research processes rather than the group learning processes that enabled this to occur. This is where a follow-up focus group would have been helpful to investigate *why* students valued the independent research processes more highly. One possible interpretation is that they valued the learning process that was most prevalent in this subject.

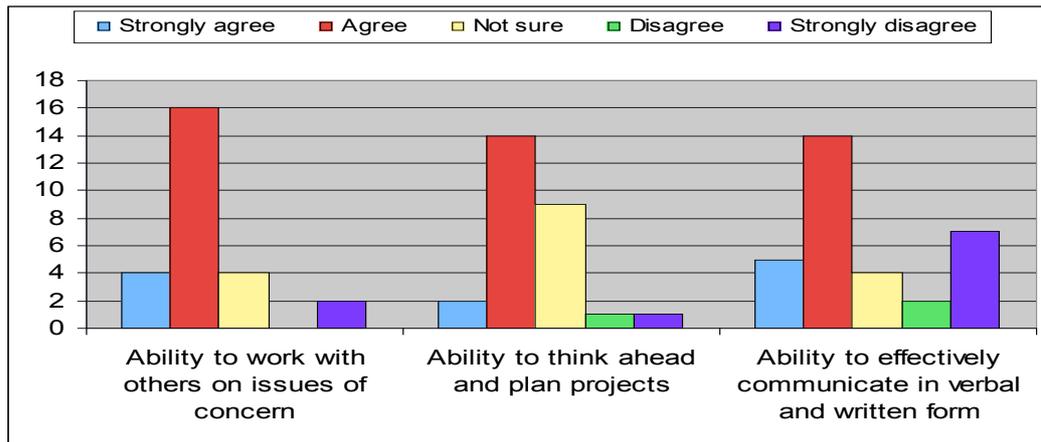
Group processes were intended to facilitate individual learning through sharing ideas, debating and critiquing within a small group. Such a process could have occurred through the on-line discussion board but students did not use it. Although students were provided with some advice (in class and online) regarding strategies for working in groups, they were expected to plan and manage their group meetings communication and decision-making processes. Students were aware that they could call on staff for assistance with their planning and group work but only two groups (out of ten) took up this opportunity. From the seminar presentations it was evident that many groups operated essentially as individuals, bringing their findings together with only loose coherence. The group process in this subject was important because all members of the group received the same mark that has the potential to lead to inequitable allocation of marks. This was particularly problematic for some highly motivated students who sought the assistance of staff to help solve some group issues. The role of the online component to facilitate group processes in this case was negligible. Several students commented on the difficulties of communicating with people they did not know as the following student comment demonstrates.

Individual differences were key factors contributing to the ineffectiveness of the group process. Noticeable factors were: abilities; personal priorities and attitudes. There were a range of academic abilities in this group, and one member's unwillingness to recognise this and seek assistance created conflict. Constructive criticisms given by other members were not well received, and the fact that the assignment was being graded as a whole was continuously on my mind. I became increasingly frustrated until assistance was sought. (Student, assignment excerpt, 2008)

This suggests that while students may be technically savvy and able to use on-line communication such as blog sites and Facebook, they may not be confident in using online learning systems in the more formal educational context. Where opportunities are available to meet face-to-face, as was possible in this subject, many students indicated in their subject evaluation that they prefer this form of interaction. This is possibly a particular characteristic of first year students in semester one where social bonds have not yet developed and may be exacerbated by the nature of a Physical and Outdoor Education course where physical and social interaction are highly valued. This however is beyond the scope of this research and could be explored in further studies.

In spite of the difficulties described above in the post-subject questionnaire, most students considered they had developed group skills as part of this subject (Figure 3), and through their evaluations had clearly considered ways of dealing with group processes in the future. Figure 3 also reveals a range of responses to 'Ability to effectively communicate in verbal and written form'. This reflects the experience of the group seminar presentation and production of the final report, both of which held significant value in terms of marks. It is possible that the range of responses depended on the group and, perhaps, their degree of success in these assignment tasks.

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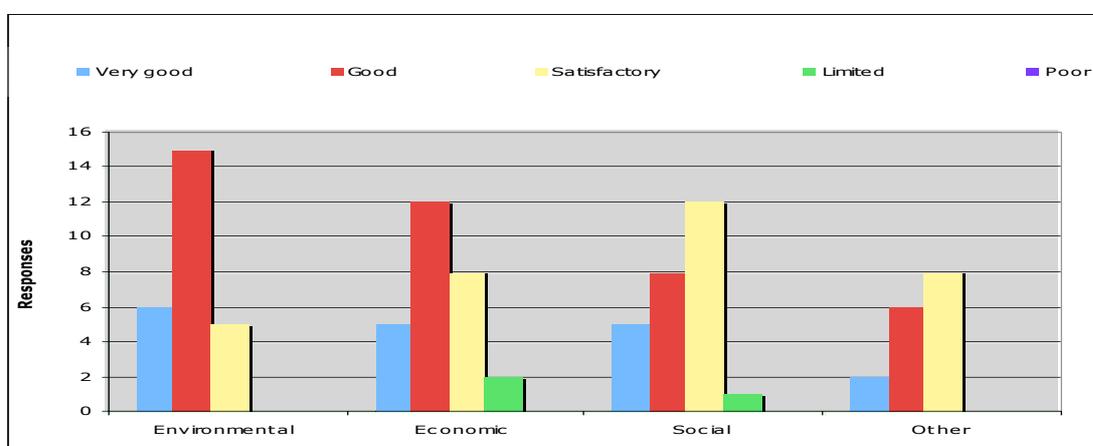


**Figure 3. Students’ reflections on group processes (Source: Post-subject questionnaire).**

**II. How do these learning processes contribute to development of environmental literacy?**

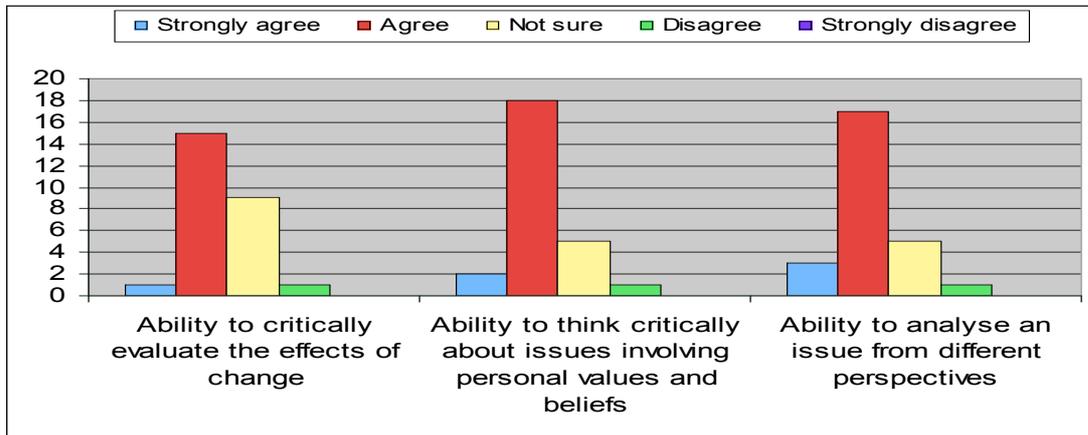
Knowledge and Understanding of Issues: A key component of understanding student learning was to gauge their prior understanding of environmental issues. In the pre-unit questionnaire students cited twelve issues that were important to them. The most dominant were climate change and water, currently issues of both global and for many students in Australia, local importance, that have a high media profile in Australia. Students obtained information from a wide range of sources including visual media (internet, magazines, newspapers, television), face-to-face (talking with friends, family) and being outdoors.

In the post-unit questionnaire students were asked to rank the extent to which they had increased their knowledge of the issue they were studying. Students ranked their understanding of their environmental knowledge of these issues above economic or social understanding (Figure 4), Given that the focus of the unit is on environmental literacy, this is probably not surprising. However through the multi-perspective analysis of issues we would have hoped for a stronger understanding of social dimensions of environmental issues. This result supports Kagawa’s (2007) findings from a study of students at the university of Plymouth. As Kagawa suggests, these findings may indicate that education relating to sustainability needs to focus on the complex relationships between environmental, social and economic issues.



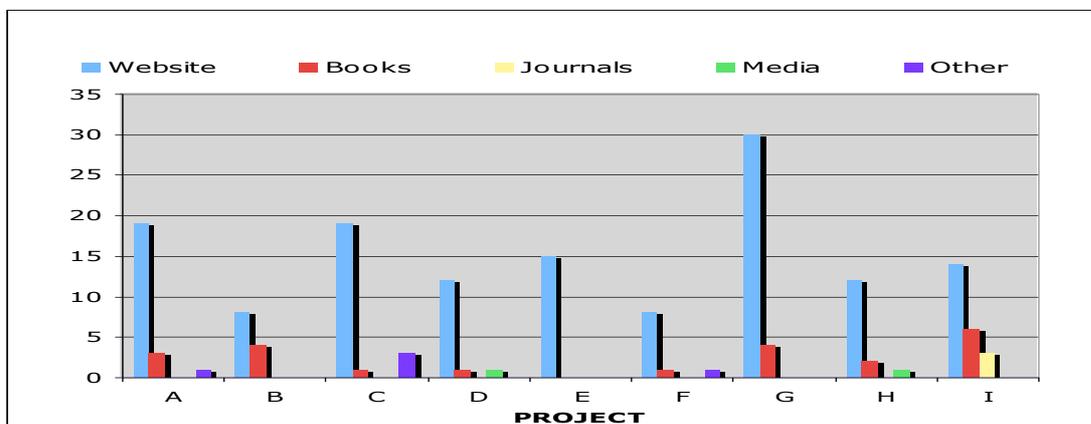
**Figure 4. Student evaluation of environmental knowledge gained post-subject**

**Critical Thinking Skills:** In the post-subject questionnaire students were asked to evaluate the critical thinking skills required as part of the subject (Figure 5). These results suggest that students considered they had developed an ability to think critically. However, this was not borne out in the staff assessment of their seminar or final written project, although it was demonstrated to some extent in their critique of a peer paper for the first assignment. This ‘gap’ between student and staff perceptions is likely to be due to different understandings about what constitutes critical thinking.



**Figure 5. Student perceptions of their critical thinking skills**

The capacity of students to develop critical thinking skills in this context was an issue of concern for us as teachers and researchers since the Internet was clearly the dominant source of information for the major project (Figure 6).



**Figure 6. Bibliographic sources for major group project assessment. (Source: Post-subject questionnaire) (Note: A-I refers to project groups)**

In this subject we deliberately attempted to engage students in critical analysis of environmental issues and in making judgements about the quality of their sources and arguments. However the assignments suggest students had not yet developed sufficient critical thinking skills to make strong judgements about the validity of online sources or to discuss the contradictions and complexities around making such judgements. The following examples from two assignments illustrate students’ attempts to critique sources and arguments:

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The evidence used in the article was gathered from various sites. Two of which were used, the blog and tourism sites, aren't as credible as the others due to anybody being able to post what they think and the tourism promoting in their favour. But saying this, all the other sources used were from good credible sites like Greenpeace who want to get the information out there. (Student, assignment excerpt, 2008)

The key question xxx poses to her readers is 'what impact does household plastic have on our environment?' She then persuades the reader that the answer to this question is that it has a negative and deadly effect on our environment and its living species, backing up her point of view. She enables the reader to clearly understand her point of view and argument as she uses emotive language like 'victim', referring to the environment, to emphasize the affect of plastic bags as they are the 'villains'. Some of xxx's facts conflict with mine; which makes you wonder how reliable either of our sources are . . . (Excerpt from student critical reflection paper, 2008)

To some extent these results are not surprising since critical thinking involves higher order skills which take time and practice to develop. The examples above show that these students have a certain level of awareness that they need to consider the reliability and credibility of sources and arguments but they have not yet developed thinking and possibly language skills to critique either sources or arguments in a more logical, sophisticated manner. However as Sterling (2004) and Stevenson (2007) point out, critical thinking skills are essential for evaluating complex issues and the assumptions underpinning different environmental positions.

In this subject many students started with limited entry-level academic skills and, with minimal face-to-face teaching time coupled with our limited understanding of how to effectively teach online, we conclude that we did not provide enough support for most students to develop strong critical thinking capacities. In effect we were expecting students to employ higher order academic skills without adequate foundational development. The assignments, rather than the self-reported results, suggest that students' need to develop *information literacy* to achieve the unit objectives. While definitions of the term information literacy are contested (see Bruce 1997) in the context of this paper it is interpreted as the capacity to access and be critical of information related to environmental issues from a wide range of sources. The independent learning approaches employed in this subject led to the dependence of students on the Internet for their information (Figure 6) and indiscriminate selection of articles for their projects. In this context information literacy is a necessary precursor to critical thinking and environmental literacy, particularly if students are to develop strong environmental literacy as suggested by Stables and Bishop (2001).

***III. What are the unintended consequences (ie hidden curriculum) for outdoor education students if learning is predominantly based in online and classroom environments (rather than outdoor environments)?***

Since it was not the focus of our research we can only surmise about unintended learning from this subject for students, but our research does suggest some likely consequences. In this final section of the paper we will discuss these to some extent but our focus is mainly on the unintended learning that occurred for *us as teachers and researchers* through the processes of developing, teaching and researching the subject. We discuss the challenges,

surprises and questions along with suggestions for further development of our teaching and research skills.

Cognitive and Affective Approaches to Learning: The focus in our subject on cognitive and rational approaches to environmental literacy is somewhat one dimensional and ignores arguments for the importance of pedagogy that enables affective as well as cognitive learning (for example see Orr, 1992, 2004; Martin 2008; Nicol & Higgins, 2005, Sterling, 2004; White, 2006). In the Environmental Literacy subject students investigated issues that can be highly emotive and which affect their own lives (for example, water and energy issues). Kagawa's (2007) research with students at Plymouth University revealed that in discussing their feelings about the future, students expressed a mixture of optimism, pessimism, frustration, anxiety, sadness and cynicism (p. 334). He also found that despite expressing positive attitudes towards the environment most students were only prepared to take 'light green' actions such as recycling or energy saving but were reluctant to challenge the consumer-driven social order through their actions (p. 333). Like the previously mentioned authors, Kagawa recognises a need for pedagogies that acknowledge the emotions in responding to and acting on environmental issues and he urges educators in higher education institutions to develop pedagogies that support young people to develop affective as well as cognitive strategies for envisioning sustainable futures and taking deep action to build such futures (2007. p. 18).

This affective dimension was *not* a feature of our planning for this subject as the brief was primarily based on cognitive learning processes. This is perhaps typical of higher education contexts even though it seems to deny the arguments of most of the environmental literacy literature. In selecting their environmental issue for investigation, students were encouraged to investigate a local issues. However with the exception of one group, students focused on regional or global issues, for example, climate change in the Great Barrier Reef or water issues in the Murray Darling Basin. This meant that many did not feel particularly connected to the issue. The one exception was a project that focused on waste production in the local community. This group was able to test claims from the literature and local council policies through observation and checking of facilities at local sites. This groups' class presentation initiated a more emotional response from the other students than did the other presentations. This example reflects Alvarez and Rogers' (2006) claims that 'real world' learning is particularly effective in helping students engage with environmental issues and to this end the subject could be strengthened by employing a more experiential and participatory approach to pedagogy that acknowledges and addresses emotional aspects of environmental issues and public debate. The issues arising around group work responsibilities may also have been circumvented or more satisfactorily dealt with if we had placed more emphasis on understanding personal and interpersonal elements of learning and of examining environmental issues. This again raises questions around the efficacy of online learning for this purpose especially given White's (2006) acknowledgement of the challenges for online learning to engage people emotionally, citing several studies that correlate 'affective learning directly with instructor immediacy' (p. 89). This is an issue that needs to be considered in planning this subject in the future.

Experiential and Virtual Learning?: These questions around cognitive and affective dimensions of learning relate also to our conceptions of experiential and online pedagogy and we recognise that some of our assumptions have indeed been challenged while others are reinforced by our teaching experiences and the research findings. Online learning is not typically used in outdoor or environmental education, in fact one could argue that working in a virtual environment is the antithesis of experiential learning in 'natural' environments. Research by Alvarez & Rogers (2006) and Martin (2008) suggests that real world'

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experiences are vital for developing personal relationships with people and with the natural world incorporating sensory experience of natural processes and direct consequences of human actions in order to generate a care or concern for particular environments or a deep sense of place. Critical to these pedagogical approaches is the holistic notion of engaging the ‘heart, hand and head’<sup>7</sup> in the learning process as advocated by Sterling (2004) and Orr (2004). In a context where these values and approaches to knowledge and learning are paramount and convincing, it has been challenging for us as teachers to adopt an online approach to teaching and learning. As relative novices to online teaching it has been difficult to marry the notion of teaching environmental literacy with pedagogy that does not appear to engage the sensory or affective learning domains or the ‘natural’ environment itself. To some extent this contradiction was also reflected in our research approach that has been somewhat reductionist in trying to isolate knowledge components and learning processes rather than adopting a more holistic approach. This presents a challenge to our future research.

However our suppositions were not necessarily borne out and we strike a paradox in the literature in that White (2006) also draws on Sterling’s and Orr’s work to advocate *for* online learning and *for* affective learning in developing environmental literacy. How can the arguments for two quite different approaches to learning and environmental literacy, draw on the same authors and similar arguments? In a higher education context White (2006) argues that online learning can foster interdisciplinary thinking, international networking, socio-political action, critical thinking, experiential and collaborative learning and ‘real-world problem solving’ (p. 97) – sound familiar! While these assertions do not yet seem to be grounded in evidence, White’s argument that through a combination of online and experiential learning, informal and formal education, boundaries can be transgressed and new opportunities for environmental education can open up, sounds both plausible and promising. With its global reach and the speed at which it allows us to share information and ideas, the Internet is a useful and, possibly, transformative tool for environmental literacy education. However online learning cannot replace the immediacy and visceral nature of personal interaction with people and places. Direct rather than virtual experiences are situated, multi-sensory, unpredictable and heterogeneous, thus providing opportunities for learning with complexity and uncertainty, both recognised characteristics of sustainability education. The key perhaps is to use *both* direct experience and virtual experience as complementary (rather than alternative) approaches to education in a rapidly changing and unpredictable world.

Primary Socialisation: A factor that may have been overlooked in preparing the brief for this subject is the role of face-to face contact at first year level in both (a) socialising and (b) socialisation in the university context. The first point refers to students’ need to meet each other, establish friendships and working relationships with each other and with staff. This process was significantly limited by the reduced class time and the emphasis on independent learning. Several students commented in their assignments<sup>8</sup> that it was difficult to choose their project groups as they didn’t know each other well enough at this early stage of the year. Student course evaluations indicated that many students would have preferred more scheduled classes rather than independent learning time (quite the contrary to university intentions). Although there may be multiple reasons for this, student assignment comments suggest that it relates to these socially oriented processes. This possibly also relates to the primary socialisation processes for students who are being introduced to and inculcated in the culture of university life and what it means to ‘be a student’ in this context (for example see Bowers & Flinders, 1990). In the POE course this may be a somewhat chaotic process in the first semester as students are expected to bridge two discipline areas, participate in multi-day

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<sup>7</sup> This term has been used by numerous educators to refer to affective, physical and cognitive learning

<sup>8</sup> This refers to the Reflection on Group Processes assignment task.

outdoor education field trips as well as attend lectures, complete assignments, manage living away from home and so on. We wonder what ‘meta-messages’ (Bowers & Flinders, 1990; Bowers 1993) might be conveyed to these students encountering a subject with irregular class attendance requirements and an expectation that students organise their own learning and use computers to become more environmentally literate? This question would be worth exploring through future research.

Teaching Questions: Teaching and developing this subject has challenged our own views about environmental education teaching and learning and our own teaching philosophies and skills. At times it was difficult to have a high level of commitment to developing online learning activities when our motivation for teaching and learning is more strongly influenced by personal engagement with students and natural environments. However in maintaining a critically reflective approach to this subject, we recognise the potential of online processes to engage with students in different ways and to enhance learning in tertiary education contexts. The issue of enthusiasm and passion for one’s teaching is a significant one however and in a sense we have had to re-skill in order to learn to use the online environment effectively (within our limitations). However we have found it more difficult to generate a sense of enthusiasm through a relationship with students mediated through the online environment. There is a distancing process here that we find disconcerting and perhaps exacerbates a feeling that we are less competent teachers in an online environment. Nevertheless the online environment has expanded our teaching options and conceptualisations of teaching and learning processes while offering students different ways to communicate with us and with each other. As White (2006) points out this can be empowering for students who like more time and space to consider their responses than is usually available in a typical tutorial. There are many opportunities here to think differently about the teacher-student and student-student relationship and forms of interaction.

The emphasis on independent learning has also shifted our role as teachers from a central to a more peripheral role in the student learning process. In terms of adopting a more student-centred approach this is possibly a positive outcome, however the results of the questionnaires and subject evaluations suggest that, for this group of students, at this stage of their academic development, they needed more guidance. To some extent this guidance could be provided through online learning but if, as student feedback seems to suggest, the majority want more face-to-face interaction with staff and students, should we revert to more traditional and experiential teaching methods? This raises questions about who is responsible for what and how university students learn and whether provision of more guidance is actually helpful in the long run? Might students’ struggles to work together and figure out what to do, be more fruitful in engendering independent and group learning skills? On the other hand, might the lack of guidance inhibit first year students’ development of sound study habits, group work strategies and critical thinking skills? Would guided experience in natural environments or involvement with local community projects have been more effective in engaging students with environmental issues, stakeholders and ethical questions? We have not resolved these questions but are trying to keep an open mind as we develop more experience with online teaching and conduct further research with students in this context.

## **Conclusions**

This research arose to some extent from our initial scepticism about the role of on-line learning for outdoor education students. On reflection it was perhaps fortunate that criteria were set for the subject that meant we could not develop it in the way we might have chosen. The boundaries these criteria imposed, encouraged us as teachers and researchers, to pay particular attention to evaluating the subject and our teaching.

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So what has been the value of this research? If anything it has raised more questions than answers. We see this as a positive step that will lead to further discussion and debate about the role of both on-line learning and its usefulness as a medium for developing environmental literacy in outdoor education at university.

The questions raised around pedagogy for developing environmental literacy, are pertinent to outdoor environmental educators, in schools as well as in higher education contexts. The increasing emphasis on online learning and interaction in education, business and social spheres challenges some deeply held beliefs of outdoor educators and perhaps educators in general. It raises significant questions around the nature of educational experiences and the need for direct experience of nature for nurturing environmental knowledge and concern. We recognise that on-line learning can play a role in outdoor and environmental learning. The challenge is finding a balance between it and outdoor experiences that focus on sustainability pedagogies. Research in the Environmental Literacy subject will continue, drawing on our experiences that, no doubt will lead to more questions worthy of debate.

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